

What is claimed:

1. A method of effectively treating hypertension, angina, or both conditions in a human patient, comprising:
administering felodipine transdermally to the human patient by applying a transdermal delivery system containing felodipine to the skin of a patient, and maintaining said transdermal delivery system in contact with the skin of said patient for at least 3 days, said transdermal delivery system maintaining an effective mean relative release rate to provide a therapeutic blood level of said felodipine within 36 hours from the initiation of the dosing interval, and thereafter maintaining a therapeutic blood level until the end of at least the three-day dosing interval.
2. The method of claim 1, further comprising providing a mean relative release rate of felodipine from said transdermal delivery system to provide a plasma level of felodipine of at least about 0.1 ng/ml within about 6 hours after application of said transdermal delivery system onto the skin of the patient.
3. The method of claim 1, further comprising maintaining a plasma level of felodipine at steady-state from about 1.0 to about 3.0 ng/ml.
4. The method of claim 1, wherein said therapeutic plasma level is maintained from about 0.1 ng/ml to about 3.3 ng/ml during the dosing interval for said transdermal delivery system.
5. The method of claim 1, wherein said transdermal delivery system has a mean relative release rate from about $0.5 \mu\text{m}/\text{hour}/\text{cm}^2$ to about $25 \mu\text{m}/\text{hour}/\text{cm}^2$ of said transdermal delivery system.
6. The method of claim 1, wherein said transdermal delivery system has a mean relative release rate from about $4.2 \mu\text{g}/\text{cm}^2/\text{hr}$ to about $20.0 \mu\text{g}/\text{cm}^2/\text{hr}$ at 24 hours; from about $3.3 \mu\text{g}/\text{cm}^2/\text{hr}$ to about $14.0 \mu\text{g}/\text{cm}^2/\text{hr}$ at 48 hours; and from about $2.7 \mu\text{g}/\text{cm}^2/\text{hr}$ to about $10.8 \mu\text{g}/\text{cm}^2/\text{hr}$ at 72 hours; as determined via an in-vitro permeation test utilizing a Valia-Chien cell where the membrane is a human cadaver skin and said cell has a receptor chamber containing a 40:60 mixture of Ethanol:water.

7. The method of claim 1, wherein said transdermal delivery system provides an in-vitro cumulative amount of permeation of from about $63 \mu\text{g}/\text{cm}^2$ to about $388 \mu\text{g}/\text{cm}^2$ at 24 hours; from about $105 \mu\text{g}/\text{cm}^2$ to about $660 \mu\text{g}/\text{cm}^2$ at 48 hours; and from about $139 \mu\text{g}/\text{cm}^2$ to about $854 \mu\text{g}/\text{cm}^2$ at 72 hours, as determined via an in-vitro permeation test utilizing a Valia-Chien cell where the membrane is a human cadaver skin and said cell has a receptor chamber containing a 40:60 mixture of Ethanol:water.

8. A method of effectively treating hypertension, angina, or both conditions in a human patient, comprising:
administering felodipine transdermally to the human patient by applying a transdermal delivery system containing felodipine to the skin of a patient, and maintaining said transdermal delivery system in contact with the skin of the patient for at least 5 days, said transdermal delivery system maintaining an effective mean relative release rate to provide a therapeutic blood level of said felodipine within three days from the initiation of the dosing interval, and thereafter maintaining a therapeutic blood level until the end of at least the five-day dosing interval.

9. The method of claim 8, wherein the plasma level of felodipine at 48 hours does not decrease by more than 30% over the next 72 hours.

10. The method of claim 8, further comprising maintaining an effective mean relative release rate of said transdermal delivery system to provide a substantially first order plasma level increase of felodipine from the initiation of the dosing interval until about 48 to about 72 hours after the initiation of the dosing interval; and thereafter providing an effective mean relative release rate to provide a substantially zero order plasma level fluctuation of felodipine until the end of at least the five-day dosing interval.

11. The method of claim 8, further comprising providing a mean relative release rate of felodipine from said transdermal delivery system to provide a plasma level of felodipine of at least about 0.1 ng/ml within about 6 hours after application of said transdermal delivery system onto the skin of the patient.

12. The method of claim 8, further comprising maintaining a plasma level of felodipine at steady-state from about 1.5 to about 2.3 ng/ml.

13. The method of claim 8, wherein said therapeutic plasma level is maintained from about 0.1 ng/ml to about 3.3 ng/ml during the dosing interval for said transdermal delivery system.

14. The method of claim 8, wherein said transdermal delivery system has a mean relative release rate from about $0.5 \mu\text{m}/\text{hour}/\text{cm}^2$ to about $25 \mu\text{m}/\text{hour}/\text{cm}^2$ of said transdermal delivery system.

15. The method of claim 8, wherein said transdermal delivery system has a mean relative release rate from about $4.2 \mu\text{g}/\text{cm}^2/\text{hr}$ to about $20.0 \mu\text{g}/\text{cm}^2/\text{hr}$ at 24 hours; from about $3.3 \mu\text{g}/\text{cm}^2/\text{hr}$ to about $14.0 \mu\text{g}/\text{cm}^2/\text{hr}$ at 48 hours; and from about $2.7 \mu\text{g}/\text{cm}^2/\text{hr}$ to about $10.8 \mu\text{g}/\text{cm}^2/\text{hr}$ at 72 hours; and a mean relative release rate from about $2.4 \mu\text{g}/\text{cm}^2/\text{hr}$ to about $8.9 \mu\text{g}/\text{cm}^2/\text{hr}$ at 96 hours; as determined via an in-vitro permeation test utilizing a Valia-Chien cell where the membrane is a human cadaver skin and said cell has a receptor chamber containing a 40:60 mixture of Ethanol:water.

16. The method of claim 8, wherein said transdermal delivery system provides an in-vitro cumulative amount of permeation of from about $63 \mu\text{g}/\text{cm}^2$ to about $388 \mu\text{g}/\text{cm}^2$ at 24 hours; from about $105 \mu\text{g}/\text{cm}^2$ to about $660 \mu\text{g}/\text{cm}^2$ at 48 hours; and from about $139 \mu\text{g}/\text{cm}^2$ to about $854 \mu\text{g}/\text{cm}^2$ at 72 hours; and from about $231 \mu\text{g}/\text{cm}^2$ to about $850 \mu\text{g}/\text{cm}^2$ at 96 hours; as determined via an in-vitro permeation test utilizing a Valia-Chien cell where the membrane is a human cadaver skin and said cell has a receptor chamber containing a 40:60 mixture of Ethanol:water.

17. A method for lessening the incidence of side-effects in a patient associated with the oral administration of felodipine, wherein the method comprises administering said felodipine in a transdermal delivery system over at least twenty-four hours and thereby lessening the incidence of side effects.

18. The method of claim 17, wherein said felodipine is administered in a transdermal delivery system applied to the skin of a human patient for about 3 to about 5 days.

19. The method of claim 17, wherein said transdermal delivery system has a mean relative release rate from about $0.5 \mu\text{m}/\text{hour}/\text{cm}^2$ to about $25 \mu\text{m}/\text{hour}/\text{cm}^2$ of said transdermal delivery system.

20. A transdermal delivery system containing felodipine or a pharmaceutically acceptable salt thereof which provides a mean relative release rate from about $0.5 \mu\text{m}/\text{hour}/\text{cm}^2$ to about $25 \mu\text{m}/\text{hour}/\text{cm}^2$ of said transdermal delivery system; a plasma level of felodipine of at least about 0.1 ng/ml by about 6 hours after application of said transdermal delivery system onto the skin of the patient; and a plasma level of felodipine at steady-state from about 0.1 to about 3.3 ng/ml .

21. The transdermal delivery system of claim 20, which provides a mean relative release rate from about $4.2 \mu\text{g}/\text{cm}^2/\text{hr}$ to about $20.0 \mu\text{g}/\text{cm}^2/\text{hr}$ at 24 hours; from about $3.3 \mu\text{g}/\text{cm}^2/\text{hr}$ to about $14.0 \mu\text{g}/\text{cm}^2/\text{hr}$ at 48 hours; and from about $2.7 \mu\text{g}/\text{cm}^2/\text{hr}$ to about $10.8 \mu\text{g}/\text{cm}^2/\text{hr}$ at 72 hours; as determined via an in-vitro permeation test utilizing a Valia-Chien cell where the membrane is a human cadaver skin and said cell has a receptor chamber containing a 40:60 mixture of Ethanol:water.

22. The transdermal delivery system of claim 20, which provides an in-vitro cumulative amount of permeation of from about $63 \mu\text{g}/\text{cm}^2$ to about $388 \mu\text{g}/\text{cm}^2$ at 24 hours; from about $105 \mu\text{g}/\text{cm}^2$ to about $660 \mu\text{g}/\text{cm}^2$ at 48 hours; and from about $139 \mu\text{g}/\text{cm}^2$ to about $854 \mu\text{g}/\text{cm}^2$ at 72 hours; and from about $231 \mu\text{g}/\text{cm}^2$ to about $850 \mu\text{g}/\text{cm}^2$ at 96 hours; as determined via an in-vitro permeation test utilizing a Valia-Chien cell where the membrane is a human cadaver skin and said cell has a receptor chamber containing a 40:60 mixture of Ethanol:water.

23. The transdermal delivery system of claim 20, comprising a backing layer which is impermeable to the active substance, a pressure-sensitive adhesive reservoir layer, and optionally a removable protective layer, the reservoir layer by weight comprising 20 to 90% of a polymeric matrix, 0.1 to 30% of a softening agent, 0.1 to 20% of felodipine base or of a pharmaceutically acceptable salt thereof and 0.1 to 30% of a solvent for the felodipine or salt thereof.

24. The transdermal delivery system of claim 20, which is a laminated composite comprising (a) a polymer backing layer that is substantially impermeable to felodipine or the pharmaceutically acceptable salt thereof; and (b) a reservoir layer comprising an acrylate or silicon based pressure-sensitive adhesive, 0.1 to 20% of felodipine base or of a pharmaceutically acceptable salt thereof, 0.1 to 30% of an ester of a carboxylic acid acting as a softening agent and 0.1 to 30% of a solvent for felodipine having at least one acidic group.

25. The transdermal delivery system of claim 20, which maintains a plasma level of felodipine at steady-state from about 1.5 to about 2.3 ng/ml.

26. A transdermal delivery system comprising felodipine or a pharmaceutically acceptable salt thereof which maintains an effective mean relative release rate to provide a therapeutic blood level of said felodipine within three days from the initiation of the dosing interval, and thereafter maintaining a therapeutic blood level until the end of at least the five-day dosing interval.

27. The transdermal delivery system of claim 25, which has a mean relative release rate of felodipine effective to provide a plasma level of felodipine of at least about 0.1 ng/ml by about 6 hours after application of said transdermal delivery system onto the skin of the patient.

28. The transdermal delivery system of claim 25, which maintains a plasma level of felodipine at steady-state from about 1.5 to about 2.3 ng/ml.

29. The transdermal delivery system of claim 25, wherein said therapeutic plasma level is maintained from about 0.1 ng/ml to about 3.3 ng/ml during the dosing interval for said transdermal delivery system.

30. The transdermal delivery system of claim 25, wherein said transdermal delivery system has a mean relative release rate from about $0.5 \mu\text{m}/\text{hour}/\text{cm}^2$ to about $25 \mu\text{m}/\text{hour}/\text{cm}^2$ of said transdermal delivery system.

31. The transdermal delivery system of claim 25, wherein said transdermal delivery system has a mean relative release rate from about $4.2 \mu\text{g}/\text{cm}^2/\text{hr}$ to about $20.0 \mu\text{g}/\text{cm}^2/\text{hr}$ at 24 hours; from about $3.3 \mu\text{g}/\text{cm}^2/\text{hr}$ to about $14.0 \mu\text{g}/\text{cm}^2/\text{hr}$ at 48 hours; and from about $2.7 \mu\text{g}/\text{cm}^2/\text{hr}$ to about $10.8 \mu\text{g}/\text{cm}^2/\text{hr}$ at 72 hours; and a mean relative release rate from about $2.4 \mu\text{g}/\text{cm}^2/\text{hr}$ to about $8.9 \mu\text{g}/\text{cm}^2/\text{hr}$ at 96 hours; as determined via an in-vitro permeation test utilizing a Valia-Chien cell where the membrane is a human cadaver skin and said cell has a receptor chamber containing a 40:60 mixture of Ethanol:water.

32. The transdermal delivery system of claim 25, wherein said transdermal delivery system provides an in-vitro cumulative amount of permeation of from about $63 \mu\text{g}/\text{cm}^2$ to about $388 \mu\text{g}/\text{cm}^2$ at 24 hours; from about $105 \mu\text{g}/\text{cm}^2$ to about $660 \mu\text{g}/\text{cm}^2$ at 48 hours; and from about $139 \mu\text{g}/\text{cm}^2$ to about $854 \mu\text{g}/\text{cm}^2$ at 72 hours; and from about $231 \mu\text{g}/\text{cm}^2$ to about $850 \mu\text{g}/\text{cm}^2$ at 96 hours; as determined via an in-vitro permeation test utilizing a Valia-Chien cell where the membrane is a human cadaver skin and said cell has a receptor chamber containing a 40:60 mixture of Ethanol:water.

33. The transdermal delivery system according to claim 23, wherein the backing layer is composed of a flexible material.

34. The transdermal delivery system according to claim 23, wherein the backing layer is selected from the group consisting of a flexible material, an inflexible material, and an aluminum foil.

35. The transdermal delivery system according to claim 23, wherein the polymeric matrix is at least one of rubber, a rubber-like synthetic homo-, co- or blockpolymer, a urethane and silicone.

36. The transdermal delivery system according to claim 23, wherein the softening agent is at least one of dodecanol, undecanol, octanol, a glycol and glycanol.

37. The transdermal delivery system according to claim 23, wherein the solvent is a monoester of a dicarboxylic acid.

38. The transdermal delivery system according to claim 23, wherein the solvent is at least one of monomethyl glutarate and monomethyl adipate.

39. The transdermal delivery system according to claim 23, wherein the polymer is a copolymer of 2-ethylhexyl acrylate, vinyl acetate and acrylic acid, the softening agent is dodecanol and the solvent is monomethyl glutarate.

40. The transdermal delivery system according to claim 23, wherein by weight the polymer is present in about 55%, the felodipine in about 10%, the solvent in about 10% and the softener in about 15%.

41. A transdermal delivery system according to claim 23, wherein the solvent is present in from about 25 to 100% the weight of the felodipine.

42. The transdermal delivery system according to claim 23, which also comprises a removable protective layer.

43. The transdermal delivery system according to claim 23, wherein the pressure-sensitive adhesive reservoir layer comprises a polymer based on an acrylate, a methacrylate, a silicon compound or a combination thereof.

44. The transdermal delivery system according to claim 23, wherein the softening ester is a medium-chain triglyceride of the caprylic/capric acids of coconut oil.

45. The transdermal delivery system according to claim 23, wherein the solvent has at least one acidic group.